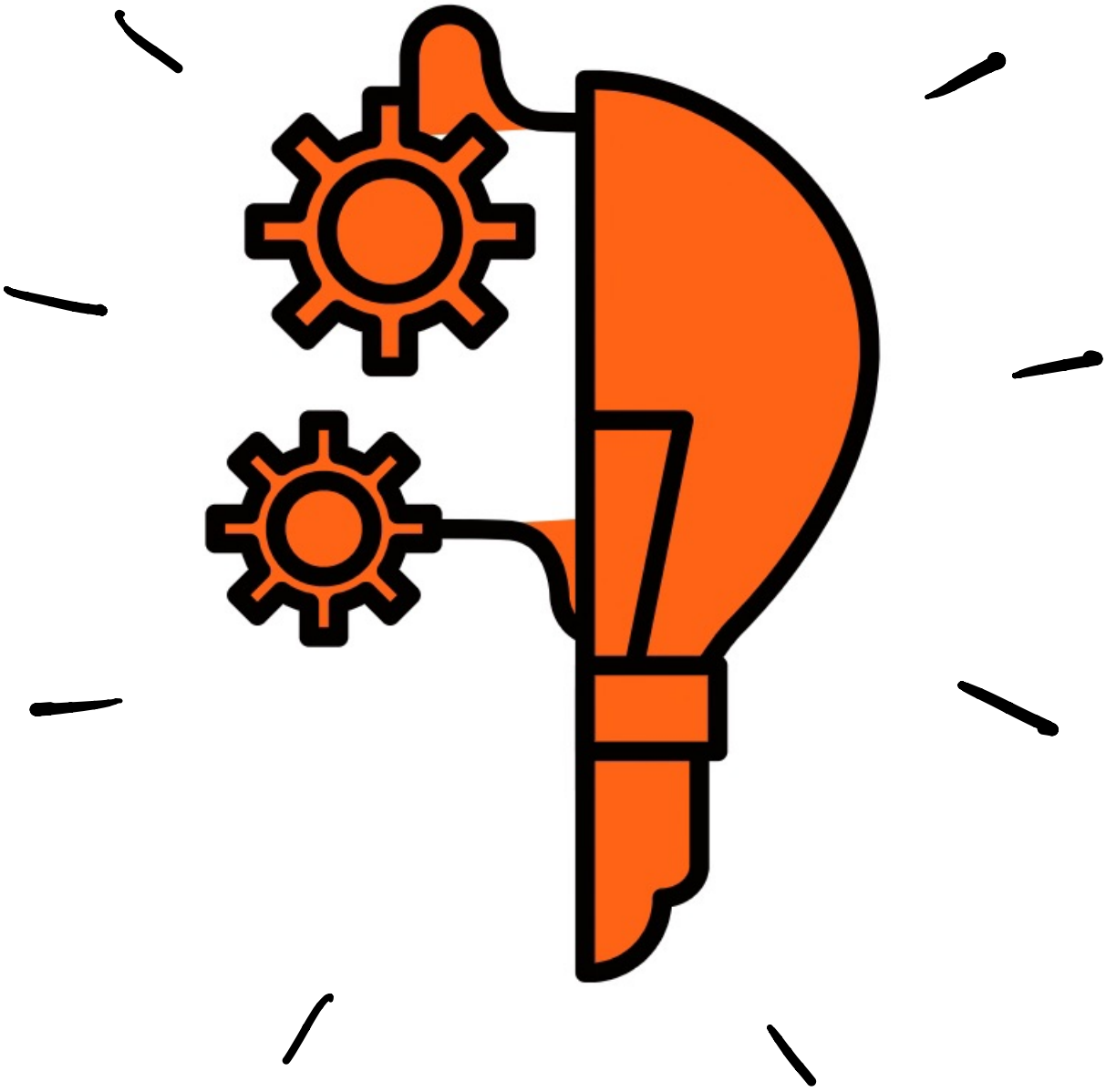
ELECTRICITY

PREVIOUS YEAR QUESTIONS



Designed With ♥

Shobhit Nirwan

2020

LP: If a person has 5 resistors each of value 1/5 Ω, then the maximum resistance he can obtain by connecting them is: [1]

(a) 1 Ω (c) 10 Ω
(b) 5 Ω (d) 25 Ω

OR

The resistance of a resistor is reduced to half of its initial value. In doing so, if other parameters of the circuit remain unchanged, the heating effects in the resistor will become [1]

(a) Two times (c) One-fourth
(b) Half (d) four-times

Sol:- Maximum resistance is obtained when all resistors are connected in series.
∴ ans:- series $R_{eq} = \frac{1}{5}+\frac{1}{5}+\frac{1}{5}+\frac{1}{5}+\frac{1}{5} \Rightarrow 1\,\Omega$

↳ (concept explained on pg-6 of notes)

notes on Shobhit Nirwan's channel on Youtube.

(OR)

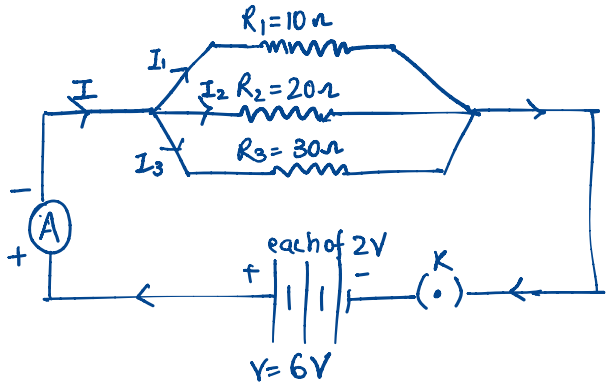
(b) ATQ, if initially resistance is R,
finally → R/2.
We know, $H \propto R$ (by Joule's law of heating (Pg-8 of notes).
So, If Resistor is reduced to half then heating effects will also become half.

LP: Draw a schematic diagram of a circuit consisting of a battery of 3 cells of 2V each, a combination of three resistors of 10, 20 and 30 connected in parallel, a plug key and an ammeter, all connected in series. Use this circuit to find the valve of the following: [5]

(a) Current through each resistor
(b) Total current in the circuit.
(c) Total effective resistance of the circuit.

(OR)

Two identical resistors, each of resistance 1Ω, are connected in (i) series, and (ii) parallel, in turn to a battery of 6 V. Calculate the ratio of the power consumed in the combination of resistors in each case. [5]



Sol:- we know in ||d, V → same, I → diff. } across each resistor (in pg 6 of notes)

(a) Current through each resistor,

R_1, $I_1 = \frac{V}{R_1} = \frac{6}{10} = 0.6A$

R_2, $I_2 = \frac{V}{R_2} = \frac{6}{20} = 0.3A$

R_3, $I_3 = \frac{V}{R_3} = \frac{6}{30} = 0.2A$

(b) Total current, $I = I_1 + I_2 + I_3 \Rightarrow 1.1\,A$

(c) Total resistance in parallel,

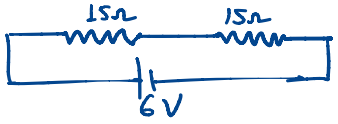
$\Rightarrow \frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$

$\Rightarrow \frac{1}{R_{eq}} = \frac{1}{10} + \frac{1}{20} + \frac{1}{30}$

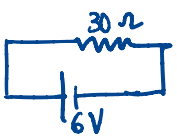
$\Rightarrow \frac{1}{R_{eq}} = \frac{6+3+2}{60} \Rightarrow \frac{11}{60}$

$\Rightarrow R_{eq} = \frac{60}{11} \Rightarrow 5.4\,\Omega$

Series,



$\equiv$ OR

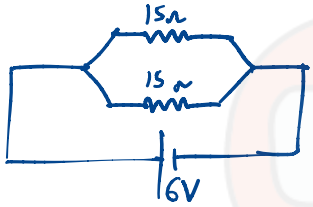


(in series $R_{eq} = R_1 + R_2$)

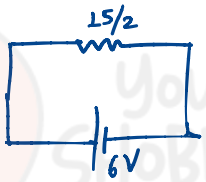
we know, $P = VI = I^2R = \frac{V^2}{R}$ (Pg (9) of notes)

using, $P_1 = \frac{V^2}{R} = \frac{(6)^2}{30}$ — (I)

Parallel,



$\equiv$



(in ||el, $\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2}$)

$P_2 = \frac{V^2}{R} = \frac{(6)^2}{(15/2)}$ — (II)

Ratio $= \frac{P_1}{P_2} \Rightarrow \frac{(6)^2/30}{(6)^2/(15/2)} \Rightarrow \frac{15}{2(30)_2} \Rightarrow \frac{1}{4}$ Ans

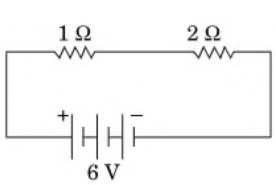
2019

LP: If the potential difference across the two ends of a conductor is 5V and the current through it is 0.2A, then what is the resistance of the conductor? [1]

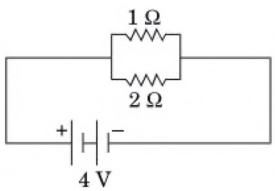
sol" $R = \frac{V}{I}$ (ohm's law)

$= \frac{5.0}{0.2} \Rightarrow 2.5\,\Omega$

LP: Compare the power used in 2Ω resistor in each of the following circuits: [5]



A



B

OR

A bulb is rated 40W; 220V. Find the current drawn by it, when it is connected to a 220V supply. Also find its resistance. If the given bulb is replaced by a bulb of rating 25W; 220V, will there be any change

in the value of current and resistance? Justify your answer and determine the change. [5]

sol: A, $R_{eq} = R_1 + R_2 = 3\Omega$

$I = \frac{V}{R_{eq}} = \frac{6}{3} \Rightarrow 2A$ → as in series ∴ same current in both resist

we know, $P = VI = I^2R = \frac{V^2}{R}$

using, $P = I^2R = (2)^2(2) \Rightarrow 8W$ — (I)

B, using $P = \frac{V^2}{R}$ → (∵ in ||le, V → same).

$P = \frac{(4 \times 4)}{2} = 8W$ — (II)

Same power consumed in both cases by 2Ω resistor.

K3B ⇒ इस sol^n में A के case में $P = I^2R$ use किया और B में $\frac{V^2}{R}$; ऐसा क्यूं?

because as $P = VI = I^2R = \frac{V^2}{R}$ → तो जो सबसे सुविधाजनक हो उसे use करें।

series में I same रहता है तो I^2R use किया।

parallel में V same रहता है तो $\frac{V^2}{R}$ use करा।

OR

(i) $P = 40W$

$V = 220V$

as, $P = VI \Rightarrow I = \frac{P}{V}$

$I = \frac{40}{220} = 0.18A$

by ohm's law, $R = \frac{V}{I}$

$R = \frac{220}{0.18} \Rightarrow 1210\Omega$

(ii) $P = 25W$

$V = 220V$

$I = \frac{P}{V} = \frac{25}{220} = 0.113A$

and, $R = \frac{V}{I} = \frac{220}{0.113} = 1936\Omega$

Yes, there is change in resistance and current value.

2018

LP: Show how would you join three resistors, each of resistance 9W so that the equivalent resistance of the combination is:-

(a) 13.5W (b) 6W

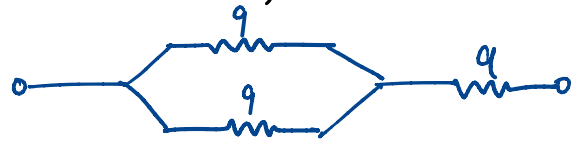
OR

(a) Write Joule's law of heating

(b) Two lamps, one rated 100W; 220V, and the other 60W; 220V, are connected in parallel to electric mains supply. Find the current drawn by two bulbs from the line, if the supply voltage is 220V.

Sol:-

(a)



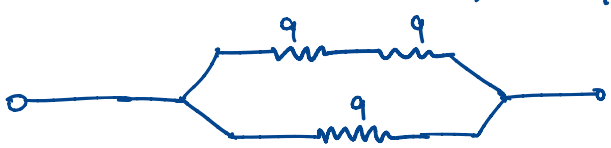
Proof, two in parallel, $\frac{1}{R_p} = \frac{1}{9} + \frac{1}{9}$

$R_p = 4.5\Omega$

Now, in series, $R_{eq} = R_p + 9$

$= 4.5 + 9 \Rightarrow 13.5\Omega$

(b)



Proof:- $R_s = 9 + 9 = 18$

$R_{eq} = \frac{1}{R_s} + \frac{1}{9} = 6\Omega$

(इस तरह के questions hit and trial से होंगे।)

(OR)

(a) Pg (8) of notes

(b) Both in ||el ∴ V → same

we know, $P = VI \Rightarrow I = \frac{P}{V}$

for 100W, $I_1 = \frac{100}{220} = 0.45A$

for 60W bulb, $I_2 = \frac{60}{220} = 0.27A$

∴ Total current (as in parallel) $= I_1 + I_2$

$= 0.72A$

LP (a) List the factors on which the resistance of a conductor in the shape of wire depends.

(b) Why are metals good conductors of electricity whereas glass is a bad conductor of electricity? Give reason.

(c) Why are alloys commonly used in electric heating devices? Give reason.

Sol: (a) Pg (4) of notes

(b) Metals have free electrons and they can move and conduct electricity, whereas glass does not allow electrons and charges to flow freely as it is an insulator.

(c) (K³B) of Pg (4) of notes.

[2018 से पहले कोई electricity से सवाल नहीं आया था।)